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DESCRIPTION  
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MOBILE RADIO COMMUNICATIONS DEVICE  
AND RELATED METHOD OF OPERATION  
AND COMMUNICATIONS SYSTEM

TECHNICAL FIELD

The present invention relates to a mobile radio communications device and to a related method of operation and communication system including a network arrangement.

BACKGROUND OF THE INVENTION

An important requirement when seeking to reduce the size and weight, and also to increase operability, of a mobile radio communications device, relates to the power requirements of a device. If power requirements can be reduced then the useful lifetime of the device can be increased and/or the size of the device can likewise be reduced.

Recent attempts to reduce the power consumption within mobile radio communication devices have tended to employ the concept of discontinuous reception which generally allows for the device to remain active, but in a sleep or idle mode, and not requiring full access to the network nor the reception of signals therefrom.

Such discontinuous reception is known in Global System for Mobile Communications (GSM) devices and also in Universal Mobile Telecommunications System (UMTS) systems and which allows for the device to save power when in an idle mode since the device is not then

required to continuously to receive downlink channels from the network.

Recent developments for mobile radio communication devices have included the provision of broadcast services such as Multimedia  
5 Broadcast Multicast Services (MBMS) which allow for the provision of specifically tailored information, i.e. news information and/or sport information, to be broadcast to a predetermined number of mobile communication devices, i.e. generally any such devices owned by users who have subscribed to a particular broadcast service.

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For MBMS enabled devices, it is required that a notification channel to be employed by the broadcast service be read continually within the mobile device so as to achieve appropriate functionality.

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Such functionality requires that the mobile communications device be informed when the MBMS sessions are to commence, and so that the device can be informed of the MBMS channel type, for example whether the channel type comprises a point-to-point channel type or whether it comprises a point-to-multipoint channel type. Also, the mobile  
20 communications device can learn from data on the notification channel whether the network needs counting such that, if counting is required, each mobile communications device subscribing to the service can declare itself to the cell of the devices that are to receive the MBMS session and the cell can then determine which channel to employ.

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As will be appreciated from the above, current operation of a MBMS arrangement requires monitoring of the notification channel in order to receive the information available and such continuous monitoring of the notification channel disadvantageously increases the  
30 power consumption required at the mobile radio communications device

even the actual MBMS transmission is arranged to take place later. Thus, in view of such continuous monitoring, it is currently not viable for MBMS enabled devices to enter into a power-saving mode such as the discontinuous reception (DRX) arrangement noted above.

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The present invention can seeks to provide for a mobile radio communications device, related method of operation and related communications system arranged for use with a broadcast service and which have advantages over known systems as noted above.

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In particular, the present invention proposes particular advantages allowing for aspects of power saving within devices and related systems allowing for broadcast sessions.

## 15 DISCLOSURE OF THE INVENTION

According to one aspect of the present invention there is provided a mobile radio communications device arranged for receiving a broadcast service and including reception means for reading a channel to be employed by the broadcast service, means for receiving otherwise than  
20 via the said channel scheduling information related to the broadcast service, means for determining from the scheduling information a start time of the broadcast service on the channel, and means for determining from the scheduling information preparation time of the broadcast service and requiring transmission on the said channel prior to the said  
25 start time of the broadcast service, and means for inhibiting monitoring of the said channel at the reception means until a time determined by the said start time less the said preparation time.

The present invention advantageously employs knowledge of the  
30 broadcast service transmission start time, and also a particular

parameter related to the preparation time, so as to identify an appropriate time at which monitoring of the notification channel can be enabled so that all information related to the broadcast service to be commenced can be received at the mobile device.

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Preferably, the means for inhibiting monitoring of the said channel comprises a software control means.

10 The scheduling information can advantageously be retrieved from a service announcement phase of data supplied to the device or from other signaling levels.

Preferably the data relating to the preparation time can be delivered to the device during a service announcement phase.

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According to another aspect of the invention there is provided a method of operating a mobile radio communications device arranged for receiving the broadcast service and including the steps of reading a channel to be employed by the broadcast service, receiving, otherwise  
20 and via the said channel, scheduling information related to the broadcast service, determining from the scheduling information the start time of the broadcast service on the said channel, determining from the scheduling information preparation time of the broadcast service and which requires transmission on the said channel prior to the start of the  
25 broadcast service and further including the step of inhibiting monitoring of the said channel until a time determined by the start time less the said preparation time.

The present invention can therefore advantageously allows for a  
30 reduction in power consumption by allowing the mobile device to operate

without the need to read, for example, the MBMS notification channel until the MBMS service is about to commence.

Yet further advantages can arise insofar as the mobile device is  
5 arranged to trigger any uplink signaling required for the counting procedure in the network when the device starts to read the notification channel.

The invention is described further hereinafter, by way of example  
10 only, with reference to the accompanying drawing which is a timing diagram illustrating the scheduling information flow between User Equipment (UE) and a radio network in accordance with an embodiment of the present invention.

As noted above, the present invention proposes a reduction in  
15 power consumption within a mobile radio communications device enabled for a reception of broadcast services and, in the illustrated example, such a service comprises MBMS. The control offered in accordance with the invention allows for the mobile device to read the MBMS notification  
20 channel until the MBMS services are about to take place.

In order to determine the time at which monitoring of the notification channel should no longer be inhibited, this described embodiment of the invention proposes the identification of the start time  
25 and which MBMS transmissions are to start on the channel and also, importantly, a parameter related to the preparation time within the Universal Terrestrial Radio Access Network (UTRAN). The information relating to such preparation and time, as with the start time, maybe supplied to the mobile device during a service announcement phrase.  
30 Within the device, the MBMS UTRAN preparation time identified is



subtracted from the MBMS transmission start time in order to arrive at a time at which the mobile terminal should commence monitoring of the notification channel in order to receive all the required MBMS notification data.

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The software arrangement within a software model within the higher layers, for example the application layer or middle layer, within the device can advantageously be employed to use the information noted above, i.e. the MBMS transmission start time and MBMS UTRAN  
10 preparation time. The invention can then provide for an accurate control of the disabling/enabling of the monitoring of the notification channel and which leads to the power-saving advantages exhibited in accordance with the present invention.

15 With regard to the parameter now identified as MBMS UTRAN preparation time, it is noted that such preparation time is generally required by the UTRAN for counting the number of mobile devices within the MBMS service area and, in accordance with a particular advantage, the triggering of the counting procedure can be initiated at  
20 the mobile device allowing for the device to trigger the uplink signaling required for the aforesaid counting when the device starts to read the MBMS notification channel.

#### BRIEF DESCRIPTION OF DRAWING

25 Fig. 1 is a timing diagram showing the timing of the various events in transmission between a network and user equipment.

#### BEST MODE FOR CARRYING OUT THE INVENTION

Turning now to the accompanying drawing, this embodiment of the  
30 present invention is described further.

As can be seen, the accompanying drawing comprises a timing diagram relating to transmissions within a communications network 10 and between a network 12 and user equipment 14 such as a mobile phone.

The vertical axis of the diagram in a direction running from the top of the diagram relates to elapsing time.

10 The operation within the device 14 commences with a service announcement 16 issued by the network 12 although the information could be provided over other signaling levels, and within the service announcement 16 there is provided data relating to the MBMS transmission start time and the MBMS preparation time.

15 The MBMS transmission start time will identify the time 18 at which data transfer is due to commence as part of the MBMS session although, as noted above, the user equipment 14 will have to commence monitoring of the notification channel at an earlier time than this so as  
20 to receive all data relating to the required MBMS preparation so as to allow for, for example, the counting procedure if required as noted above.

Once the MBMS preparation time period 20 has been identified for the user equipment 14, then a software module within the user  
25 equipment, and generally provided at a higher level such as within the application or middleware layers, serves to determine the exact time 22 at which monitoring of the notification channel should commence, and which is prior to the transmission start time 18 by a time period equivalent to the MBMS preparation time 20. Thus, the MBMS session  
30 is effectively enabled at 22 so that all data relating to the MBMS

preparation, and the subsequent data transfer is received by the user equivalent 14.

Subsequent to the start of the data transfer 18, data such as an  
5 MBMS bearer release 24 and the user equipment leaving signal 26 is transmitted between the network 12 and user equipment 14 as illustrated in the drawing.

The present invention advantageously leads to the adjustment of  
10 the content of the MBMS signaling and the implementation of the above-mentioned software module on the terminal side in order to schedule the MBMS notification channel monitoring based on both the MBMS transmission start time and the MBMS preparation time parameters.

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It should of course be appreciated that the present invention is not restricted to the details of the foregoing embodiment.

For example, the data relating to the MBMS transmission start  
20 time may be provided over other signaling levels than the service announcement phase although it is important that the broadcast service includes scheduling information relating to an at least informal estimate of when the particular broadcast service is due to commence.

25 Through the above-mentioned control of the enabling disabling of monitoring of the notification channel, a mobile radio communications device arranged for use with broadcast services such as MBMS can advantageously also exhibit power-saving characteristics such as those arising with DRX arrangements.

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